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ENTOMOLOGICAL NEWS

NOVEMBER 1948

Vol. LIX No. 9

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PUBLISHED MONTHLY, EXCEPT AUGUST AND SEPTEMBER, BY
THE AMERICAN ENTOMOLOGICAL SOCIETY
PRINCE AND LEMON STS., LANCASTER, PA.
AND
THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA 3, PA.

Subscription, per yearly volume of ten numbers: $4.00 domestic; $4.30 foreign; $4.15 Canada.
Entered as second-class matter April 19, 1943, at the post office at Lancaster, Pa., under the Act of March 3, 1879. Acceptance for mailing at the special rate of postage prescribed for in Section 1, Act of October 3, 1917, authorized January 15, 1921.

ENTOMOLOGICAL NEWS

ENTOMOLOGICAL NEWS is published monthly, excepting August and September, by The American Entomological Society at 1900 Race Street, Philadelphia 3, Pa., U. S. A.

PHILIP P. CALVERT, Editor Emeritus. R. G. SCHMIEDER, Editor. Editorial Staff: E. T. CRESSON, JR., E. J. F. MARX, E. T. MOUL, J. A. G. REHN, and A. G. RICHARDS.

Subscription price, per yearly volume of 10 numbers: Domestic, $3.00; Foreign, $3.30; Canada, $3.15—U. S. Currency.

SUBSCRIPTIONS, ADVERTISEMENTS: All communications and remittances to be addressed to **ENTOMOLOGICAL NEWS, 1900 Race Street, Philadelphia 3, Pa.**

ADVERTISING RATES: Full width of page. Payments in advance.

	1 Inch	2 Inches	3 Inches	6 Inches
One Issue	$ 2.50	$ 4.50	$ 6.50	$10.00
Five Issues	9.00	17.00	24.00	42.00
Ten Issues	16.00	30.00	42.00	72.00

MANUSCRIPTS and all communications concerning same should be addressed to **R. G. Schmieder, Zoological Laboratory, University of Pennsylvania, Philadelphia 4, Pa.**

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ENTOMOLOGICAL NEWS

VOL. LIX NOVEMBER, 1948 No. 9

The Biology of Two Sunflower Gall Makers (Diptera: Cecidomyiidae; Lepidoptera: Lyonetiidae)

By OSMOND P. BRELAND [1] and LUCILLE HAGAN SCHMITT,[1]
The University of Texas

The senior author has in two previous papers published the results of studies of certain sunflower insects (Breland, 1938; 1939). The present discussion deals with insects not previously considered. The objectives of this work were to investigate the biology of two species of sunflower gall makers, and to determine the species of parasites with which they are associated. Material has been collected from several localities, but most of the biological work has been done with insects from Austin, Texas, and vicinity. The insects considered here are the tubular bud gall maker, *Trishormomyia helianthi* (Brodie) (Cecidomyiidae), and the lepidopteron that forms a spindle gall on the sunflower stems, *Bucculatrix fusicola* Braun (Lyonetiidae). These studies have extended over several years, but the work was intensified during 1946, 1947 and 1948.

Several hundred galls of each type were collected and dissected during the period. Each gall was opened on one side only, and its contents examined before removal. If the insect within, whether parasite or gall maker, was a mature larva or a pupa, it was removed and placed in a covered staining dish to complete its life cycle. When the insect inside the gall was in an early larval stage, it was transferred into an artificial gall made by rolling a piece of lens paper into a cylinder and twisting the ends. These lens paper galls were then placed in a

[1] The writers greatly appreciate the assistance of Messers A. B. Gahan, C. F. W. Muesebeck, Carl Heinrich and the late E. P. Felt who determined some of the insects discussed in this paper.

covered staining dish. Moisture was maintained by adding an occasional drop of water to a piece of toweling paper inside the dish. Immature gall makers were seldom reared by this method, presumably because they were removed from their food supply, but considerable success was attained with the parasites. The immature parasite and its host were placed in a cylinder, and allowed to remain here until the parasite had become a mature larva or had pupated. The contents of the artificial gall were easily examined from time to time. This method of rearing proved superior to that of wrapping a partially opened gall in a piece of lens paper, since the gall either shriveled or developed mold causing the death of the occupants.

Each gall maker will be discussed separately, followed by notes on the parasites associated with each species.

Trishormomyia helianthi (Brodie)

The tubular bud gall and the insect producing it were originally described by Brodie (1894) as occurring on the sunflowers *Helianthus decapetalus* and *H. divaricatus* in Canada. Brodie gave the gall maker the name of *Diplosis helianthi.* Felt (1913) placed the insect in the genus *Hormomyia,* and later (1920) transferred it to *Trishormomyia* where it remains at this writing.

The tubular gall is more common in this area than is the gall of *Bucculatrix fusicola.* It occurs on *Helianthus annuus,* and as yet has not been found on other composites in the vicinity. In this area there is considerable variation in the size, structure and the position of the galls on the plants. Size is presumably somewhat dependent upon rainfall. During dry summers the galls have a tendency to average smaller than when more rain occurs. They have been found to range from ten to fifty millimeters in length. In many cases the galls occur as polythalamous structures of ten to twenty-five divisions. Ten to fifteen of these large galls may be found on a single plant. Single galls are sometimes collected, but these are most often near the polythalamous galls on the main axis of the plant. Both types of galls are also found at the bases of and on the lateral branches of the sunflowers. Occasionally single galls are formed in the

leaf axil or on the petiole, or even on the involucre of the flowers. Double or triple galls sometimes develop in these latter locations, but they rarely have more divisions than this.

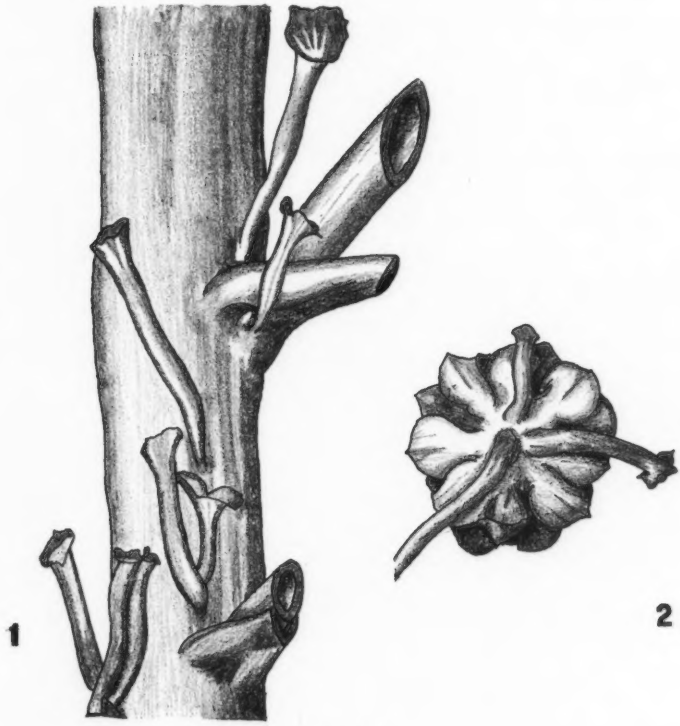


PLATE *I*

Galls of *Trishormomyia helianthi* (Brodie). Fig. 1. Single and double galls on main axis of sunflower. Fig. 2. Two single galls on involucre of flower. Approximately natural size.

Variations of the galls in size, shape and position on the host plant are indicated in plates I and II.

In all winter collections the gall makers have been mature larvae, indicating that the insect passes the winter in this stage. The first appearance of mature galls in the spring varies somewhat, and is probably partially dependent upon climatic conditions. In the spring of 1947, mature galls were first found in the field near the end of May, and some adults emerged from galls that were collected at that time. In the spring of 1948, however, rainfall was slight, and mature galls were not recovered from the field until the last of June. Mature galls have been collected in the fall and winter, and kept outside in breeding bags until spring. Gall makers were first noted to emerge near the middle of April.

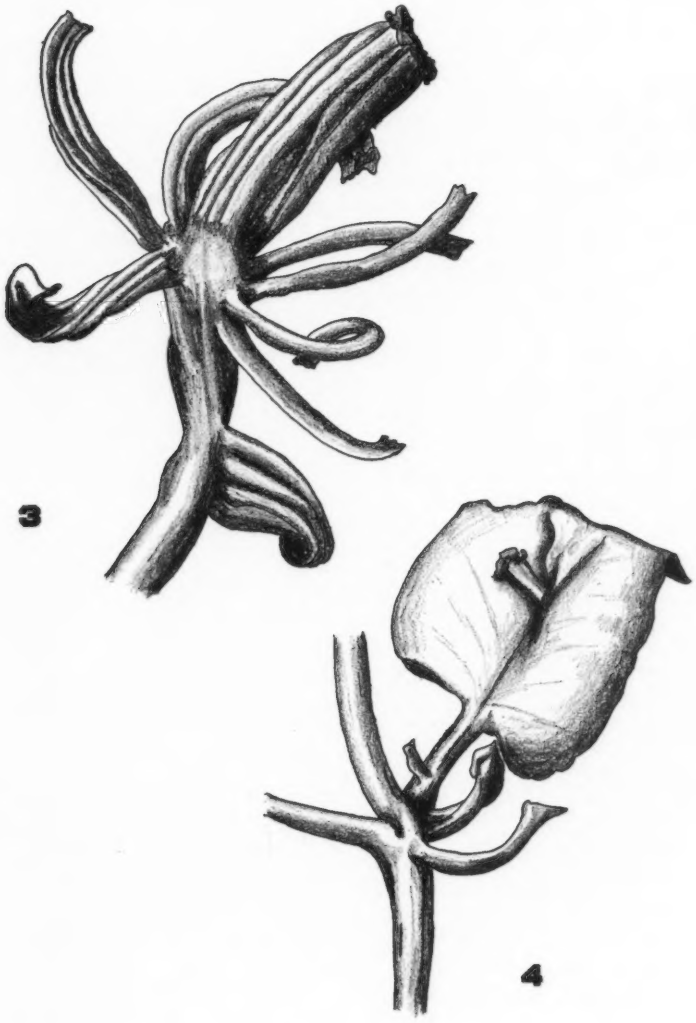
It is thought probable that two generations of *T. helianthi* occur per year in this area, although emergence of the spring generation is spread over several months. Large numbers of pupae and adults have been obtained in June and July, and mature larvae removed from galls pupated within a short time in the laboratory. After this time, however, most of the gall makers were in the larval stage, and mature larvae seldom pupated although they remained alive in the laboratory for several months.

The normal mature larva of *T. helianthi* is from three to four millimeters in length. It is quite inactive, opaque, salmon-colored and exhibits definite segmentation. The gradual transformation of the larva into a pupa requires four to five days, during which time the general shape changes from an oval to a longer spindle-shape. The head and thorax assume a deep orange waxy appearance during this period. The pupal period averaged 9 days for a few individuals.

The adult insect emerges from the gall through the natural opening at the flanged tip. All observations indicate that before the adult insect emerges, the pupa, by writhing movements, propels its body up the hollow tube of the gall and partially

PLATE *II*

Galls of *Trishormomyia helianthi* (Brodie). Fig. 3. A cluster of polythalamous and single galls. Fig. 4. Galls on leaf, petiole and in axil. Approximately natural size.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protrudes through the opening at the end; then the adult insect breaks through the pupal skin and emerges. Free pupae in staining dishes exhibited a writhing movement for several hours, or for even a day before the adults emerged. In two cases, during dissection, pupae were seen at the tips of galls, and in several instances when adults emerged from the galls in the laboratory, pupal skins were found at the gall openings.

Parasites: More than 2,500 galls have been dissected during the studies of the gall makers and their parasites. Collections have been made during practically all months of the year, although in winter the host plants were dead and the galls were difficult to find in numbers. A total of 593 galls were found to be unoccupied, probably because the gall makers or their parasites had emerged or had died and disintegrated before the galls were examined. On the basis of occupied galls only, the cecidomyiid exhibited an overall parasitism of 60.4 per cent. Many of the unparasitized larvae were immature when collected so that it is possible that the percentage of parasitism would have been greater if these immature insects had been allowed to become mature.

Parasites reared included *Torymus brevis* Breland (1948), (Torymidae), and undescribed species of *Leptacis* and *Platygaster,* family Scelionidae. *Torymus brevis* was invariably found to be an external parasite of the larvae of the gall maker, while both *Leptacis* sp. and *Platygaster* sp. are internal parasites. The next to last larval stage of *Leptacis* sp. is a cyclopoid larva, similar to those that have been reported for other species within the family. Although cytological studies were not made, evidence indicates the *Platygaster* is a polyembryonic species. Many individuals that emerge simultaneously develop within a single host larva. Most of the broods observed consisted of a majority of one sex, while all members of an occasional brood were of the same sex. In addition, the bodies of the host larvae containing the parasites are always very similar to the host bodies of species that have been established as being polyembryonic.

Bucculatrix fusicola Braun

This insect produces the so-called spindle gall on the stems of sunflowers. It was originally described by Braun (1920) from Cincinnati, Ohio, as producing galls on the sunflower, *Helianthus tracheliifolius*.

In the region of Austin, Texas, the gall has been collected only on the sunflower, *H. annuus*. Most frequently the galls produced by this lepidopteron are found on the main axis of the plant, but they also occur on the secondary branches. The shape of the gall is apparently greatly dependent upon the size of the stem upon which it is formed. On small stems, galls are usually spindle-shaped and symmetrical, and resemble the original description as given by Braun. However, if the gall develops on a stem more than a centimeter in diameter, it generally appears as a small bump or swelling on only one side of the stem. Galls in this area are from one to two centimeters in length with an average of about one and a half centimeters. They average somewhat shorter than those originally described by Braun which averaged approximately two centimeters in length, and many have a greater diameter. Braun's galls had a maximum width of one-half a centimeter, but in this region, some are as much as one centimeter in diameter. Variations in the size and shape of the galls are indicated in plate III. Galls were first obtained in the field in late July, but they occur only in small numbers until somewhat later than this.

The normal larva of the gall maker is quite active. It displays a characteristic habit of twirling rapidly when the gall is opened and the insect is disturbed. This reaction was observed in all of the larval instars that were examined. The average mature larva is a light cream color and from seven to nine millimeters in length. Parasitized larvae are completely inactive.

Most larvae of the gall maker do not become mature until fall, and they pass the winter in the larval stage as they have been reported to do in Ohio (Braun, 1920). Larvae obtained in September were approximately one-half the size of those collected in October. No pupae have been found until spring,

but mature larvae collected in winter and kept in the warm laboratory temperature exhibited a decided tendency to pupate. There is apparently only a single generation per year.

Just prior to pupation the larva changes in color from a cream to a greenish gray color, and the skin becomes loose and wrinkled. After eating a small hole in the side of the gall, the larva emerges and spins its cocoon on the stem of the plant near the gall. Larvae kept in the laboratory in artificial galls of lens paper emerged from these galls and spun cocoons on pieces of toweling paper on the floor of the cage in which the insects were kept. Several cocoons have been found in the field on stems of plants near the galls (plate III, fig. 8). The cocoons averaged one centimeter in length, and in most instances they are formed above the gall with the head of the larva or pupa directed away from the gall. An occasional cocoon has been found below the gall. The pupal period in the laboratory ranged from ten to fourteen days.

Cocoons that have been observed differ considerably from those described by Braun (1920), who found that the cocoons were dark brown fuscous, and that the outer surface was smooth. Those examined by the writers have been white to a light gray color, while the outer surface had a series of longitudinal ridges (plate III, fig. 8). These variations may of course be variations of the type that occur frequently in different parts of the ranges of many species. However, in view of the differences in the cocoons, and those in the size and shape of the galls previously noted, it would not be at all surprising if some future worker with good series were to find that the lepidopteron in this region is closely related to, but different from, the species described by Braun.

Parasites: During the course of these studies, more than 1,000 galls of the lepidopteron were collected throughout the year, dissected and examined. Of this number, 152 were empty, indicating that the gall maker or its parasites had emerged or died before the galls were collected. The overall percentage of parasitism, calculated on the basis of occupied galls, was 42 per cent.

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PLATE *III*

Galls of *Bucculatrix fusicola* Braun. Figs. 5 to 7. Variation in size and shape of the galls. Fig. 8. Galls and cocoons of *B. fusicola*. Approximately natural size.

Parasites reared from *B. fusicola* included *Eupelmus cyaniceps* Ashmead (1886) (Eupelmidae), *Eurytoma* sp., tentatively determined as *Eurytoma tylodermata* Ashmead (1896) (Eurytomidae), and a new species of *Microbracon,* family Braconidae. The braconid is an external parasite of the lepidopteron larva, and when the parasitic larva becomes mature, it spins a cocoon inside the gall and remains here until it emerges an adult. *Eupelmus cyaniceps* is most often an external parasite of the gall maker, but it sometimes occurs within the cocoon of the braconid mentioned above, in which case it is an external larval parasite of this insect. The eurytomid has always been found as an external parasite of the larval gall maker.

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Observations on the Incidence of Ticks on Kenya Mammals

By Neal A. Weber, Swarthmore College,
Swarthmore, Pennsylvania

In January-February 1948 the Central African Expedition of the American Museum of Natural History, led by Dr. James L. Clark, was on safari for several weeks in Kenya 0–30 miles from the Tanganyika frontier and less than 100 miles from Lake Victoria.[1] As biologist to the expedition I had an opportunity to examine briefly a series of freshly killed mammals with respect particularly to their ectoparasites. Although time was limited because of other activities it was possible to make some observations on the incidence of these on the mammals as well as to make representative collections.

Through Willis J. Gertsch the ticks have been identified by Glen M. Kohls of the United States Public Health Service and I am also indebted to H. E. Anthony and T. Donald Carter for identification of the mammals. I am obliged to Brayton Wilbur for the opportunity to examine the mammals.

Most of the parasites are deposited in the collections of the American Museum of Natural History except for representatives retained by the United States Public Health Service for further study or for its own collections.

While the immediate environment of these ticks was of course the skin of the mammals, the ecology of the region played an important part in determining the incidence of infestation.

The region is one of high plains, a savannah of short grass with scattered clumps of trees and bushes as well as thin forest bordering the intermittent streams. The general elevation is about 5,500 feet above sea level and numerous volcanic hills and ridges rise a few hundred feet higher. January and February are usually considered to be dry months with rains breaking the long dry season in March. The region is uninhabited by hu-

[1] Within a radius of 20 miles of Latitude 1°38′ South and Longitude 35°17′ East.

mans because the infected tsetse flies (Glossina) prevent the Masai people of the area from keeping their indispensable cattle.

Though without permanent habitations here the Masai set grass fires during the dry seasons that burn through this region and help to prevent a thick, lush growth which would afford good cover for the ticks. The fires must burn tremendous numbers and the short grass makes it harder for ticks hanging to it to transfer to the flanks of the larger mammals. This periodic burning is of course an ancient practice and to be thought of as part of the normal primitive environment. Such factors probably contributed to some Thomson's gazelles, for example, being apparently free of any ticks. Indeed, a record given below is of a tick found crawling rapidly over the blistering, hard soil with scanty short grass and showing this as a means of dispersal. By way of comparison, in the longer grass of the southern Sudan, ticks were taken hanging on the stems a foot or more above ground in readiness to transfer to mammals.

The plains supported large numbers of a great variety of the larger mammals and there appeared to be a nice balance between predators and their prey. Lion and leopard probably made nightly kills in the vicinity of the camp. Jackals and hyenas were numerous and apparently well fed. The generally abundant grass seemingly supported more ruminants or a greater weight of ruminants than a good cattle ranch of Western United States of America.

There was also a balance between the mammals and their ectoparasites. No sickly mammal was seen and none was heavily infested. Any sickly or crippled animal of course would not have survived long. No domestic horses were more sleek or in better condition than the abundant herds of zebras which, like the similarly abundant herds of antelope, were commonly seen at close range.

There was, in short, as "natural" conditions as could be expected in an Africa inevitably changing with civilization, and the records here given, though unavoidably less quantitative than qualitative, are of interest in this connection.

Collections were made from the following mammals:

Warthog. *Phacochoerus aethiopicus aeliani* (Cretzschmar)

A large male carried both ticks and fleas. *Hyalomma savignyi* (Gerv.) and *Rhipicephalus simus* Koch [2] adults of both sexes were found.

Hartebeest. *Alcelaphus buselaphus cokii* (Günther)

Rhipicephalus evertsi Neum.[3] and *Haemaphysalis leachii* Aud.[4] adults of both sexes were taken about the anus of a male host and were few in number. A single adult female *Boöphilus* species (probably *decoloratus* Koch) [5] was also taken.

Another male host apparently carried no adult ticks but a single small nymphal *Rhipicephalus* species was found deep in one ear.

Topi. *Damaliscus korrigum jimela* (Matschie)

No ectoparasites aside from two nymphal *Rhipicephalus* species could be found on a male host. The nymphs were in an ear.

Another male host similarly appeared to carry no adults but again contained two nymphal *Rhipicephalus* species in one ear.

Waterbuck. *Kobus defassa* Rüppell

A male which I shot in the Anglo-Egyptian Sudan (Muragatika, Prov. Equatoria, August 8, 1939) had several female *Haemaphysalis aciculifer* Warb. (det. Dr. Bequaert) on the inguinal region.

Reedbuck. *Redunca redunca wardi* (Thomas)

A single male adult *Amblyomma variegatum* (Fabr.) [6] at one eyelid was all to be seen on a male host.

[2] *Rhipicephalus simus* Koch, believed to be a vector of the protozoon disease anaplasmosis, caused by *Anaplasma* species. A three-host species.

[3] *Rhipicephalus evertsi* Neumann, the red tick, vector of East Coast fever and of equine piroplasmosis caused by the protozoon, *Nuttallia equii* (Laveran). A two-host species.

[4] *Haemaphysalis leachii* (Audouin), the common dog tick of Africa and vector of malignant jaundice in dogs caused by the protozoon, *Babesia canis* (Piana and Galli-Valeris).

[5] *Boöphilus decoloratus* (Koch), vector of two protozoon diseases of cattle caused by *Babesia bigemina* (Theobald Smith) and *Anaplasma marginale* Theiler.

[6] *Amblyomma variegatum* (Fabricius), vector of the disease known as heartwater caused by *Rickettsia ruminatium* (Cowdry).

Dik-dik. *Rhychotragus kirkii cavendishi* (Thomas)

A female host had a few adult *Ixodes pilosus* Koch of both sexes about the eyes.

Impalla. *Aepyceros melampus rendilis* Lonnberg

Adult *Boöphilus decoloratus* of both sexes and nymphal *Amblyomma* species were taken on a young male host.

A few adult *Rhipicephalus evertsi* of both sexes were taken at the base of the scrotum of a second male host. No others were seen. A third male host carried nymphs and males of this species in an ear and a female at the anus. Another female was taken on grass in the gorge of the Siabe River, Kenya, at an altitude of 5,850 feet.

Grant's gazelle. *Gazella granti granti* Brooke

Adult *Rhipicephalus evertsi* and *Boöphilus decoloratus* of both sexes were taken on the flanks and about the anus of a male host.

Thomson's gazelle. *Gazella thomsonii thomsonii* Günther

These attractive and numerous little gazelles were remarkably free from adult ticks and on several none could be found. One male had *Rhipicephalus evertsi* adult males at the anus only, another had a single adult female of *Rhipicephalus neavei* at the margin of the sub-orbital gland.

Eland. *Taurotragus oryx pattersonianus* Lydekker

A male eland about six years of age in excellent condition had numerous adult ticks of five species chiefly on the perineal region. *Rhipicephalus evertsi* and *Amblyomma variegatum* appeared to be the most numerous and were in close clusters on the skin. *Hyalomma savignyi* and *Rhipicephalus capensis* Koch [7] males and *Amblyomma cohaerens* Dönitz of both sexes were taken in smaller numbers.

[7] *Rhipicephalus capensis* Koch, the Cape brown tick and vector of the highly fatal East Coast fever of cattle caused by the protozoon, *Theileria parva* (Theiler). A three-host species.

Zebra. *Equus burchellii böhmi* Matschie

The sleek coats of the abundant zebras appeared to be completely free of ticks. Adults would have been prominent in the short, appressed fur. They were found only on the inguinal and perineal regions and, rarely, in the ears. Scarring of the flanks and at the border of the inguinal regions may have indicated that the zebras picked off ticks at these places with their teeth, or it may have come through fighting.

On one male zebra *Rhipicephalus evertsi* adults, chiefly male, occurred at the perineum and mostly on the scrotum posteriorly. On another male the same tick species and a single male adult *Amblyomma variegatum* were taken on the inguinal and perineal regions, including the base of the penis. The *Rhipicephalus* were numerous and in the proportion of about two males to one female.

A male and a female zebra each had *Rhipicephalus evertsi* adults in the inguinal and perineal regions with engorged nymphs of probably the same species in the ears.

Rhinoceros. *Diceros bicornis bicornis* (Linnaeus)

Dr. Thomas of Nairobi kindly gave me adult ticks of both sexes of *Amblyomma petersi* Karsch which he had taken from a male rhinoceros on his safari near ours.

Elephant. *Loxodonta africana* (Linnaeus)

No opportunity to collect ticks from elephants presented itself in Kenya. At the Elephant Training School in Northeastern Belgian Congo which Colonel Offerman has long conducted he obligingly had about forty elephants examined for me. Each elephant has the same native mahout assigned to it consistently and this man takes excellent care of his charge. These men report ticks scarce on elephants. One elephant was known to have had a single tick attached to it in the morning but this was absent later in the day during the examination. Ticks could not be seen on the other elephants.

Hare. *Lepus capensis crawshayi* De Winton

Numerous adults of *Rhipicephalus oculatus* Neum. and an adult female *Haemaphysalis leachii* were taken mostly on the neck and ears of a hare found in grass-woodland with grass of a length longer than that of the open plains. Close by on the same morning hartebeest, impalla and a small mongoose were shot, the hartebeest and impalla each having *R. evertsi* instead of *R. oculatus* while both the hartebeest and the mongoose carried *H. leachii.*

Lion. *Felis leo massaica* Neumann

Ticks on a large male lion weighing 400–500 pounds had caused a severe lesion at the posterior margin of the mane and this was the only place badly infested. Three species of adults of ticks were present, *Haemaphysalis leachii, Rhipicephalus capensis* and *R. simus,* the latter being the most numerous and *capensis* being the least numerous.

Mongoose, large, gray. *Mungos mungo colonus* (Heller)

Two mongoose out of a pack of seven running over the open plain about 5:30 P.M. were shot and examined. Each contained a few male *Haemaphsalis leachii* in the ears. At another time a young male mongoose was found to have a single nymphal *Haemaphysalis* species.

Mongoose, short-tailed, brownish yellow. Unidentified

This much smaller and brownish yellow instead of grayish mongoose also carried adult *Haemaphysalis leachii* but sparingly.

Hyena. *Crocuta crocuta fisi* Heller

A large male hyena had a few adult *Rhipicephalus simus* of both sexes on the ears. Another specimen examined some hours after death appeared to be free of ticks although in life it may have carried them.

Bat-eared fox. *Octocyon megalotis virgatus* Miller

An adult female appeared to carry few ectoparasites although these included three species of adult ticks, *Haemaphysalis leachii*

male and female, *Haemaphysalis* species males and *Rhipicephalus simus* male and female. One small tick, doubtless a male, was taken in one ear, another of the same sex at an eyelid.

Silver-backed jackal. *Thos mesomelas mcmillani* Heller

An adult female carried a few adult *Haemaphysalis leachii* of both sexes and a male *Rhipicephalus simus* generally distributed on the skin.

Other Records

A large unengorged female *Amblyomma petersi* was taken January 23 in short grass at the edge of thin forest. The next day in a similar place single ticks, *Rhipicephalus simus,* of both sexes were taken on me. Also on me February 5 while walking in grass of moderate length above a rocky stream bed a female of the same species was taken. A European took from his leg at 6 A.M. February 3 a nymphal *Amblyomma* species. An unidentified large flat tick, probably an unengorged female, was taken in the middle of a sunny day as it crawled rapidly over hot dry soil with scanty grass near my tent.

Three additional records are from the Belgian Congo. North of Beni 20 miles in the Ituri high rain forest a female *Rhipicephalus dux* Dönitz was taken on my trouser leg February 25, a dry season time. East of Stanleyville 10 miles, also in high rain forest, a male *Haemaphysalis leachii* came down to the ground sheet from the dense vegetation above while an aerosol bomb was being used to collect insects March 17. While talking with a European gentleman seated next to me in a plane flying from Stanleyville, Congo, to Europe I noticed a small tick (*Rhipicephalus sanguineus* Latreille) [8] on his neck. It had probably been acquired in or near Stanleyville from human habitations and was sluggish in the cool of the cabin at 8,500 feet altitude.

[8] *Rhipicephalus sanguineus* (Latreille), the common brown dog tick widely distributed in the tropics and subtropics. A vector of malignant jaundice in dogs caused by the protozoon, *Babesia canis* (Piana and Galli-Valerio).

Conclusions

In as "natural" an area of Africa as may readily be found at the present time observations were made under severe time limitations of the ectoparasites, especially ticks, of a representative series of African mammals. The region was a high plains of short grass with scattered woodland and free from human habitations because of the tsetse fly (*Glossina*) infected with African sleeping sickness or nagana. Periodic burning of the grass undoubtedly destroyed vast numbers of ticks and must have been a factor in keeping the numbers down although there were available as food great numbers of mammalian hosts of many species and sizes. Only one mammal, a lion, bore a marked lesion from tick bites. No sickly mammal was seen. Predators and scavengers would quickly dispose of any appearing. One large mammal, an eland, carried five species and some small to medium sized mammals such as Thomson's gazelle appeared to be free of ticks.

That ticks may rapidly be transferred from one area to another is shown by a record of one on a man's neck in a plane flying from Stanleyville, Belgian Congo to Europe.

Permanent Mounts of Dissections to be Kept with Pinned Specimens

By John W. H. Rehn[1]

In the course of various studies on the Orthoptera it has been found necessary to make numerous dissections. Microscopic slides are not usually used for the preservation of material of this group and but little material is kept in fluid preservatives. Moreover, as a result of the desire to keep all portions of the specimens dissected in one place several methods are in use.

The extending of the genitalia of the Acridoidea, while still leaving them attached, is thoroughly suitable for these and cer-

[1] Research Associate, Columbia University; Research Associate, School of Tropical Medicine, San Juan; Research Associate, Academy of Natural Sciences of Philadelphia.

tain other structures. When mouthparts and other relatively small portions are removed they can usually be stored in glycerine in 5 by 10 mm. shell vials that are placed on the pin under the specimen.

However, when wings, and certain other structures, are removed this latter method is not convenient, as the organ or part must be removed and arranged for examination. The older method of mounting such portions of a specimen on cards, that can be pinned under the specimen, has been found unsatisfactory as they cannot be examined by transmitted light. As a result of examining numerous Blattaria wings the following method which allows for immediate examination has been evolved. This has been found satisfactory for all small and many moderate sized dissections. The structure is mounted between two glass cover slips separated by 2 ply bristol board. The size of the cover slips depends on the size of the object to be mounted. Square or rectangular slips are much more convenient than round ones. A piece of bristol board is cut in a U-shape so that the arms may extend along the opposite sides of the cover slip. At the base it is left protruding so that it may be placed upon the insect pin. A cover slip is fastened [2] to the outer surface of this piece of bristol board. After this has hardened, the dissection, after routine handling, is mounted on this base the same as on any slide. The cavity is filled with mounting media and the preparation is closed on the top by another cover slip of the same size. The open end of the U allows for contraction during drying, and for the addition of media if it is found necessary.

A dry mount may be made by essentially the same method. The dissection is placed on the first cover slip and covered with a second one. In this method they are placed one on top of the other, instead of being separated by the thickness of the bristol board. The second cover slip can be held in place by a gummed label.

Mounts made ten years ago by this method are at present in excellent condition, and I believe will last as long as any of the usual forms of slides.

[2] I have used only Canada balsam for mounting purposes but believe that most other standard media would serve as well.

Additional Records of Bat Parasites of the Family Nycteribiidae

By R. B. EADS and G. C. MENZIES, Bureau of Laboratories, Texas State Department of Health

Several specimens of the family Nycteribiidae were among the ectoparasites taken by Dr. Frank W. Blair, University of Texas mammalogist, and a group of his students on a field trip to the Big Bend National Park of Texas in June of 1948. These curious, wingless flies were tentatively identified as *Basilia antrozoi* (Townsend). Dr. J. C. Bequaert kindly checked them and stated that both *Basilia antrozoi* and *B. corynorhini* Ferris were represented. The lot included four female *B. corynorhini* and five *B. antrozoi* (3 males and 2 females) taken from *Antrozous pallidus* (Le Conte) by J. L. Reagan in Presidio County, Texas.

Basilia corynorhini was described by Ferris in 1916 from a single female taken from *Corynorhinus macrotis* in Tulare County, California. Dr. Bequaert says that the Texas specimens "agree well with the original account, except that the finger-shaped extensions of the second tergite are more elongate." As far as can be ascertained this is the first collection record other than that from which the original description was made.

Host and locality records for *Basilia antrozoi* are more numerous. Dr. G. H. Ferris, 1916 (Ent. News, *27*), lists the following: original description from a single female off an *Antrozous pallidus* taken in New Mexico; five specimens off *Antrozous pallidus* from Ventura and Merced Counties, California; and in 1924 (Ent. News, 35) from *Antrozous pallidus* and *Myotis californicus,* Santa Anita, Lower California, Mexico; from *Corynorhinus macrotus,* East Painted Cave, Texas; from *Nyctinomus cynocephalus,* New Orleans, Louisiana; and from Dulzura and Stanford University, California, off *Antrozous pallidus.* H. M. Smith, 1934 (Jour. Kansas Ent. Soc., *7*, 62-64), lists this species off *Antrozous* sp. taken in Barber County, Kansas.

Current Entomological Literature

COMPILED BY RAYMOND Q. BLISS AND R. G. SCHMIEDER.

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia and the University of Pennsylvania, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded

This list gives references of the year 1948 unless otherwise noted. Continued papers, with few exceptions, are recorded only at their first installment.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

NOTE: The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the List of periodicals and serials published in our January and June issues. The number of the volume, and in some cases, the part, heft, &c is followed by a colon (:). References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to Neotropical species, and not so indicated in the title, have the symbol (S).

Papers published in ENTOMOLOGICAL NEWS are not listed.

GENERAL—Anon.—Obituary: George Shirley Brooks. [23] 79: 170, 1947. **Bailey, S. F.**—An annotated list of N. Amer. Thysanopterists. Pt. I. [Florida Ent.] 31: 35–49. **Batte, E. G.**—A technique for mounting ectoparasites. [37] 41: 523–24. **Bromley, S. W.**—Honey-bee predators. [45] 56: 195–99. **Bushnell, O. A.**—A list of scientific institutions in the Pacific area. [Pacific Sci., Honolulu.] 11: 243–61. **Callan, E. McC.**—Effect of defoliation on reproduction of Cordia macrostachya. [19] 39: 213–15. **Deputy, O. D.**—Editorial: Are foreign plant quarentines worth while? [37] 41: 528–31. **O. E. Essig**—Theodore Dru Alison Cockerell. (Obit. with portrait by T. Dix, and list of biographies.) [60] 24: 117–31. **Ferris, G. F.**—The principles of comparative morphology. [50] 13: 50–56. **Frank, Hutchinson, Livingston, McCulloch, and Wiener**—Teleological mechanisms. [Ann. N. Y. Acad. Sci.] 50 (4): 187–278. **Grant, C.**—Selection between armed and unarmed arthropods as food by various animals. [39] 40: 66. **Gulick, A.**—The evolution of terrestrial life as seen by a biochemist. [81] 67: 267–72. **Hatch, M. H.**—The "complete" taxonomist. [Coleopt. Bull.] 2: 71–72.—Why locality labels? *Ibid.*: 76. Hayward, C. L.—Biotic communities of the Wasatch chaparral, Utah. [25] 18: 473–506. **Hoffmann and Merkel**—Fluctuations in insect populations associated with aerial applications of DDT to forests. [37] 41: 464–73. **Holmes, S. J.**—What is natural selection? [81] 67: 324–30. **Howard, N. F.**—Obituary: Loyd W. Brannon. [37] 41: 527. **Kempson, Thomas and**

Baker—A simple method for phase-contrast microscopy. [74] 89: 351–58. **Lees, A. D.**—The historical aspect of insect distribution. (A review of papers by B. P. Beirne, R. Jeannel, F. E. Zeuner.) [Science Progress] 36 (144): 695–98. **Lindsey, A. W.**—The fallacy of Communism. [58] 48: 169–75. **Lord, F. A.**—Australian moth is World's largest. [39] 40: 46–46. **Michener, C. D.**—Obituary, T. D. A. Cockerell. [45] 56: 171–74. **Milum, V. G.**—Some factors affecting the color of honey. [37] 41: 495–505. **Miner, F. O.**—A carbon tetrachloride killing bottle. [37] 41: 506–07. **Muller, H. J.**—Letter of resignation of Professor Muller from Academy of Science of U.S.S.R. [80] 108: 436. **Noble and Gammon**—Obituary: Cecil Cline Wilson. [37] 41: 525–26. **Oettlé, A. G.**—A rapid catoptric technique for recognizing axial illumination of the substage condenser. [Jour. Royal Micro. Soc.] 67: 9–13, 1947, Pub. Sept. 1948. **Orton, C. R.**—The problem of quarantining of plant viruses. [37] 41: 477–86. **Pearse, A. S.**—Zoological names, a list of phyla, classes and orders. Prepared for Section F, A.A.A.S. 3rd ed., Durham, North Carolina. **Potter, C.**—Some biological problems in the study of insecticides. [The Advancement of Sci.] 5: 94. **Schilder, F. A.**—Probleme und Methoden der Biostatistik III. Die Ausgleichskurve (der trend). [Biol. Zentralbl.] 66: 401–16, 1947. **Teale, E. W.**—The strength of the frail. [Nature Mag., Washington, D. C.] 41: 401–04 (popular). **H. B. W.**—"Useless and ill-advised." [45] 56: 154.—Insects and slang. *Ibid.:* 170. **Watts, R. H.**—A mass-production method for paraffin and frozen sections. [Jour. Royal Micro. Soc.] 67: 19–20, 1947, Pub. Sept. 1948. **Wigglesworth, V. B.**—The contribution of insect physiology to the study of insecticides. [The Advancement of Sci.] 5: 94–95.—Chemical stimuli and insect behavior. (A review of Dethier's book.) [53] 162: 150

ANATOMY, PHYSIOLOGY, MEDICAL—Abdel-Malek and Goulding—A study of the rate of growth of two sclerotized regions within larvae of four species of mosquitoes. [58] 48: 119–28. **Auclair, J. L., and C. A. Jamieson**—A qualitative analysis of amino acids in pollen collected by bees. [80] 108: 357–58. **Barron and Tahmisian**—The metabolism of cockroach muscle (Periplanete americana). [105] 32: 57–76. **Bettini e Barachini**—Primi risultati della lotta con l'Octa-Klor ed il gammaesano contar le mosche domestiche resistenti al DDT. [Riv. Parassit.] 9: 85–91. **Brunson and Allen**—Oriental fruit moth parasites.

[37] 41: 446–50. **Cleveland, L. R.**—An ideal partnership (Blatt.). [81] 67: 173–77. **Cooper, K. W.**—The evidence for long range specific attractive forces during the somatic pairing of dipteran chromosomes. [41] 108: 327–35. **Dade, H. A.**—The laboratory diagnosis of honey-bee diseases. [Jour. Quekett Micros. Club] ser. 4, vol. 2: 272–85, ill. **Doutt, R. L.**—The suitability of insect-conditioned plant tissues as habitats for successive insect species. [60] 24: 121–22.—Arrenoclavus, a new genus of polyembryonic Encyrtidae. *Ibid.*: 145–48, ill. **Dowden, Buchanan and Carolin**—Natural-control factors affecting the spruce budworm. [37] 41: 457–64. **Eckert, J. E.**—Toxicity of some of the newer chemicals to the honeybee. [37] 41: 487–91. **Filho, J. O.**—Sôbre a genitália das fêmeas de Hepialidae. [Summa Brasil. Biolo.] 1 (16): 384–425, 1947, Publ. May 1948. **Glasgow and Collins**—Ecological, economic and mechanical considerations relating to the control of ticks and Rocky Mountain spotted fever on Long Island. [37] 41: 427–31. **Hagmann, L. E.**—Overwintering habits of Phaenicia sericata. [37] 41: 510. **Hanke, R.**—The nervous system and the segmentation of the head in the Hirudinea (Annelida). [50] 13: 57–64. **Haseman, L.**—An authentic case of ox warble in man. [37] 41: 515. **Henry, L. M.**—The nervous system and the segmentation of the head in the Annulata (continued). Section V. Onychophora, Section VI. Chilopoda, Section VII. Insecta. [50] 13: 27–48. **Jahn and Koel**—The effect of temperature on the frequency of beat of the grasshopper heart. [5] 41: 258–66. **Lees, A. D.**—The function of the corpora allata of insects. (Review of articles by Wigglesworth and others.) [Science Progress] 36: 698–70. **Lee, H. T.**—A comparative morphological study of the prothoracic glandular bands of some lepidopterous larvae with special reference to their innervation. [5] 41: 200–05. **Lees and Beament**—An egg-waxing organ in ticks. [74] 89: 291–332 & Pl. I. **Lejeune and Filuk**—The effect of water levels on larch sawfly populations. [23] 79: 155–60, 1947. **Lord, K. A.**—The sorption of DDT and its analogues by chitin. [Biochem. Jour.] 43: 72–78. **Mendes, L. O. T.**—Sôbre a meiose de Dysdercus mendesi (Pyrrhocor.). [Bragantia, Brasil] 7: 243–56, 1947. **McGregor, E. A.**—A newly detected structure in certain tetranychid mites. [65] 50: 173–75. **Munger, F.**—Body-temperature measurements of the California red scale. [37] 41: 422–23. **Munger and Cressman**—Effect of constant and fluctuating temperatures on the rate of develop-

ment of California red scale. [37] 41: 424–27. **Neri, I.**—Osservazioni morfologiche sul pretarso delle culicine. [Riv. Parassit.] 9: 93–96. **Neiswander, R. B.**—Plum curculio on peaches and plums in Ohio. [37] 41: 450–53. **Nielsen, A.**—Postembryonic development and biology of Hydroptilidae. A contribution to the phylogeny of the caddiceflies and to the question of the origin of the case-building instinct. [Det Kong. Danske Videnskabernes Selskab, Biol. Skrifter] 5 (1): 1–200. **Pflugfelder, O.**—Die Entwicklung embryonaler Teile von Carausius (Dixippus) morosus in der Kopfkapsel von Larven und Imagines. [Biol. Zentralbl.] 66: 372–87, 1947.—Volumetrische Untersuchungen an der Corpora allata der Honigbiene, Apis mellifica. *Ibid.:* 67: 223–41. **Piza, S. de T., Jor.**—Comportamento dos cromosômios sexuais do Dysdercus mendesi na segunda divisão dos espermatócitos (Pyrrhocor.). [Bragantia, Brasil] 7: 269–71, 1947. **Rensch, B.**—Histological changes correlated with evolutionary changes of body size. [100] 2: 218–30. **Roth and Lindquist**—Ecological notes on the deer fly at Summer Lake, Oregon. [37] 41: 473–76. **Salles, H.**—Sôbre a genitália dos drosofilídios: (I. Drosophila melanogaster e D. simulans). [Summa Brasiliensis Biol.] 1 (15): 311–83, 1947, Publ. Mar. 1948. **Shaw, F. R.**—A contribution to the phylogeny of the Mycetophilidae. [5] 41: 189–99. **Simmonds, F. J.**—The effective control by parasites of Schematiza cordiae, Barber, in Trinidad. [19] 39: 217–20. **Uvarov, B. P.**—Anti-Locust Bulletin. 1. Recent advances in acridology. Anatomy and physiology of Acrididae. [88] 99 (1): 1–75. Reprinted by the Anti-Locust Research Center, Brit. Mus., London. **Wallace, B.**—Studies on 'Sex-Ratio' in Drosophila pseudoobscura. I. Selection and 'Sex-Ratio.' [100] 2: 189–217. **Wellington and Henson**—Notes on the effects of physical factors on the spruce budworm, Choristoneura fumiferana (Tortric.). [23] 79: 168–70, 1947. **Wiersma, C. A. G., and Zawadzki, B.**—On the relation between different ions and peripheral inhibition in crustacean muscle. [105] 32: 100–03.

ARACHNIDA AND MYRIOPODA—Glasgow and Collins—(See under Anatomy.) **Goodnight, C. J., and M. L.**—A new member of the genus Caddo (Phalangid). [45] 56: 201–03. **Lees and Beament**—(See under Anatomy.) **McGregor, E. A.**—(See under Anatomy.) **Rousselot, R.**—Hyalomma brumpti. Description de la larve et de la nymphe. Biologie. [Ann. Parasit. Hum. et Comp.] 23:

31–34. **Strandtmann, R. W.**—Atricholaelaps traubi and A. chinchillulae, from callosciurius and the chinchilla respectively (Acarina). [65] 50: 187–92 (*). **Travassos Santos Dias, J. A.**—Quelques cas curieux d'anomalies observés chez Ixodidés des generes Rhipicephalus et Aponomma. [Annales de Parasit.] 23: 27–30.

SMALLER ORDERS—Bailey, S. F.—Thysanoptera. (See under General.) **Edmunds, G. F., Jr.**—A new genus of mayflies from western North America (Leptophlebiinae). [63] 61: 141–48. **Emerson, K. C.**—A new Mallophaga from a ruffed grouse. [43] 21: 92–95, ill. (k to Goniodes). **Gurney, A. B.**—Notes on nearctic Hemerobiidae with descriptions of two new species (Neuroptera). [5] 41: 213–22 (k). **Kimmins, D. E.**—A new species of Acroneuria (Plecoptera) from Trinidad. [68] 17: 105–06, ill. **Mosely, M. E.**—The venation in the genus Hydroptyla (Trichoptera). [68] 17: 107–08. **Nielsen, A.**—Trichoptera. (See under Anatomy.) **Sommerman, K. M.**—Two new nearctic psocids of the genus Trichadenotecnum with a nomenclatorial note on a third species (Corrodentia). [65] 50: 165–73. **Wygodzinsky, P.**—Redescription of Nesomachilis maoricus Tillyard 1924, with notes on the family Machilidae (Thysanura). [Dom. Mus. Rec. in Ent., Wellington, N. Zealand] 1 (6): 69–78, ill.

ORTHOPTERA—Barron and Tahmisian—(See under Anatomy.) **Cleveland, L. R.**—(See under Anatomy.) **Jahn and Koel**—(See under Anatomy.) **Pflugfelder, O.**—(See under Anatomy.) **Uvarov, B. P.**—(See under Anatomy.)

HEMIPTERA—Barber, H. G.—Records of the species of Nysius occurring in the Dominion of Canada (Lygae.). [23] 79: 194, 1947. **Beamer, R. H.**—Some new species of Delphacodes (Fulgorid). [43] 21: 96–110, ill. **Caldwell and DeLong**—A new species of Issidae from California. [58] 48: 176–77. **De Carlo, J. A.**—Los Ranatridae de Sud America. [An. Mus. Argent. Cien. Nat. "B. Riv."] 42: 1–38, 7 pls., 1946–47. **DeLong, D. M.**—A proposed new genus name Marganana and the allotype description of Prairiana hirsuta DeL.—Gypcninae (Cicadell.). [58] 48: 101.—Two new species of Neokolla closely related to Gothica (Cicadell.). [60] 24: 141–44, ill. **DeLong and Hershberger**—A synopsis of the genus Iowanus in N. Amer., including Mexico. [58] 48: 107–15 (k*). **Drake, C. J.**—New genera and species of Tingidae. [63] 61: 149–56. **Mendes, L. O. T.**—(See under Anatomy.) **Munger, F.**—(See under Anat-

omy.) **Munger and Cressman**—(See under Anatomy.) **Piza, S. de T., Jor.**—(See under Anatomy.)

LEPIDOPTERA—Brunson and Allen—(See under Anatomy.) **Clark, A. H.**—A new subspecies of Glaucopsyche lygdamus (Lycaen.). [65] 50: 176–78. **Dowden, Buchanan and Carolin**—(See under Anatomy.) **Filho, J. O.**—(See under Anatomy.) **Gardener, J. C. M.**—On larvae of the Noctuidae. [88] 99 (8): 291–318, ill. **Lee, H. T.**—(See under Anatomy.) **Lord, F. A.**—(See under General.) **Wellington and Henson**—(See under Anatomy.)

DIPTERA—Alexander, C. P.—Records and descriptions of neotropical crane-flies (Tipul.), XXIII. [45] 56: 137–48 (*). **Arnett, R. H., Jr.**—Notes on the distribution, habitat and habits of some Panama culicines. Part II. [45] 56: 175–93. **Bettini e Barachini**—(See under Anatomy.) **Carpenter, J. J.**—Gyandromorphism in Aëdes canadensis. [37] 41: 522–23. **Dowden, Buchanan and Carolin**—(See under Anatomy.) **Faurchild and Hertig**—Notes on the Phlebotomus of Panama (Psychod.). III. P. cruciatus, trinidadensis and gomezi. [5] 41: 247–57. **Hagmann, L. E.**—(See under Anatomy.) **Haseman, L.**—(See under Anatomy.) **Neri, I.**—(See under Anatomy.) **Palmer, E. L.**—Fly time. [Nature Mag., Washington, D. C.] 41: 417–24 (popular, educational). **Parsons, C. T.**—A classification of N. Amer. Conopidae. [5] 41: 223–46. **Roth and Lindquist**—(See under Anatomy.) **Salles, H.**—(See under Anatomy.) **Shaw, F. R.**—(See under Anatomy.) **Wallace, B.**—(See under Anatomy.)

COLEOPTERA—Callan, E. McC.—(See under General.) **Cartwright, O. L.**—The American species of Pleurophorus (Scarab.). [83] 74: 131–45 (k*).—Ataenius strigatus (Say) and allied species in the U. S. (Scarab.). *Ibid.*: 147–53. **Dibb, J. R.**—The eco-taxonomic approach to the study of beetles. [Coleopt. Bull.] 2: 61–65.—Beetle ecology (1). *Ibid.*: 73–74. **Fender, K.**—The Cavicollis-Corneus group of Podabrus (Cantharid.). [60] 24: 131–40 (k*). **Guppy, R.**—Corrections and additions to "Some records of Carabidae collected on Vancouver Island." [Coleopt. Bull.] 2: 75–76. **Hicks, S. D.**—Brachyrhinus raucus a European weevil new to N. Amer. [23] 79: 171, 1947. **Klapperich, H.**—Notes about German and Austrian coleopterists and collections. [Coleopt. Bull.] 2: 67. **Kono, H.**—A new species of Curculionidae, Phyllobius intrusus, injurious in the state of Rhode Island. [63] 61: 169–70. **Lane, M. C.**—Some generic corrections in the Elateridae.

I. [65] 50: 179–82. **Leech, H. B.**—Collecting larvae of two species of Ditylus (Oedemer.). [Coleopt. Bull.] 2: 66–67.—Host records for Calopus angustus (Oedemer.). *Ibid.*: 75. **Martinez, A.**—Addenda y corrigenda al trabajo de Blackwelder "Checklist of the Coleopterous insects of Mexico, C. A., West Indies and So. Amer." (Scarab.). [Arthropoda] 1: 109–14, 1947. **Monrós, F., y J. M. Viana**—Revisión sistemática de los Hispidae argentinos. [An. Mus. Argent. Cien. Nat. "B. Riv."] 42: 125–324, 27 pls., 1946–47. **Neiswander, R. B.**—(See under Anatomy.) **Ritcher, P. O.**—Descriptions of the larvae of some ruteline beetles with keys to tribes and species. [5] 41: 206–12. **Robinson, M.**—A new species of Canthon with a key to the Humectus group (Scarab.). [83] 74: 155–58. **Simmonds, F. J.**—(See under Anatomy.)

HYMENOPTERA—Auclair and Jamieson—(See under Anatomy.) **Bohart, R. M.**—The genus Euparagia in North America (Vespidae). [60] 24: 149–54 (k*). **Bromley, S. W.**—(See under General.) **Brown, W. L.**—A preliminary generic revision of the higher Dacetini (Formicid.). [83] 74: 101–29, ill. (k*). **Brunson and Allen**—(See under Anatomy.) **Dade, H. A.**—(See under Anatomy.) **Doutt, R. L.**—(See under Anatomy.) **Dowden, Buchanan and Carolin**—(See under Anatomy.) **Eckert, J. E.**—(See under Anatomy.) **Evans, H. E.**—Two new southwestern spider wasps (Pompilidae). [60] 24: 123–30. **Gregg, R. E.**—An unusual nest of the prairie mound-building ant. [65] 50: 183–86. **Hicks, S. D.**—An unusual nesting site for the ant Lasius flavus nearcticus. [23] 79: 170–71, 1947. **Lejeune and Filuk**—(See under Anatomy.) **Milum, V. G.**—(See under General.) **Pflugfelder, O.**—(See under Anatomy.) **de Santis, L.**—Adiciones a la fauna Argentina de afelínidos (Chalcidoidea). [Notas del Museo de la Plata] 13 (Zool. 101): 43–48. **de Santos, L.**—Estudio monográphico de los a felínidos de la República Argentina (Chalcidoidea). [Rev. Museo de la Plata, n.s., sec. Zool.] 5: 23–280 (k*). **Scullen, H. A.**—New species in the genus Eucerceris with notes on recorded species and a revised key to the genus. [60] 24: 155–64. **Spieth, H. T.**—Notes on a colony of Polistes fuscatus hunteri. [45] 56: 155–69. **Timberlake, P. H.**—Additions and corrections to the list of Nearctic species of Dianthidium (Apoidea). [45] 56: 149–53 (k*). **Weber, N. A.**—A revision of the N. Amer. ants of the genus Myrmica Lat. with a synopsis of the Palearctic species. II. [5] 41: 267–308.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

Diptera—Tachinidae-Dexiidae wanted, No. Amer. and exotic. Will collect most orders in exchange or will purchase. P. H. Arnaud, 60 Woodrow St., Redwood City, Calif.

Will collect—Zoological and entomological specimens in tropical and subtropical parts of Peru. Jose M. Schunke, Pucallpa, Peru.

Wanted—Diplotaxis; will buy or exchange. E. W. Mange, 307 W. Walnut St., Hanover, Pa.

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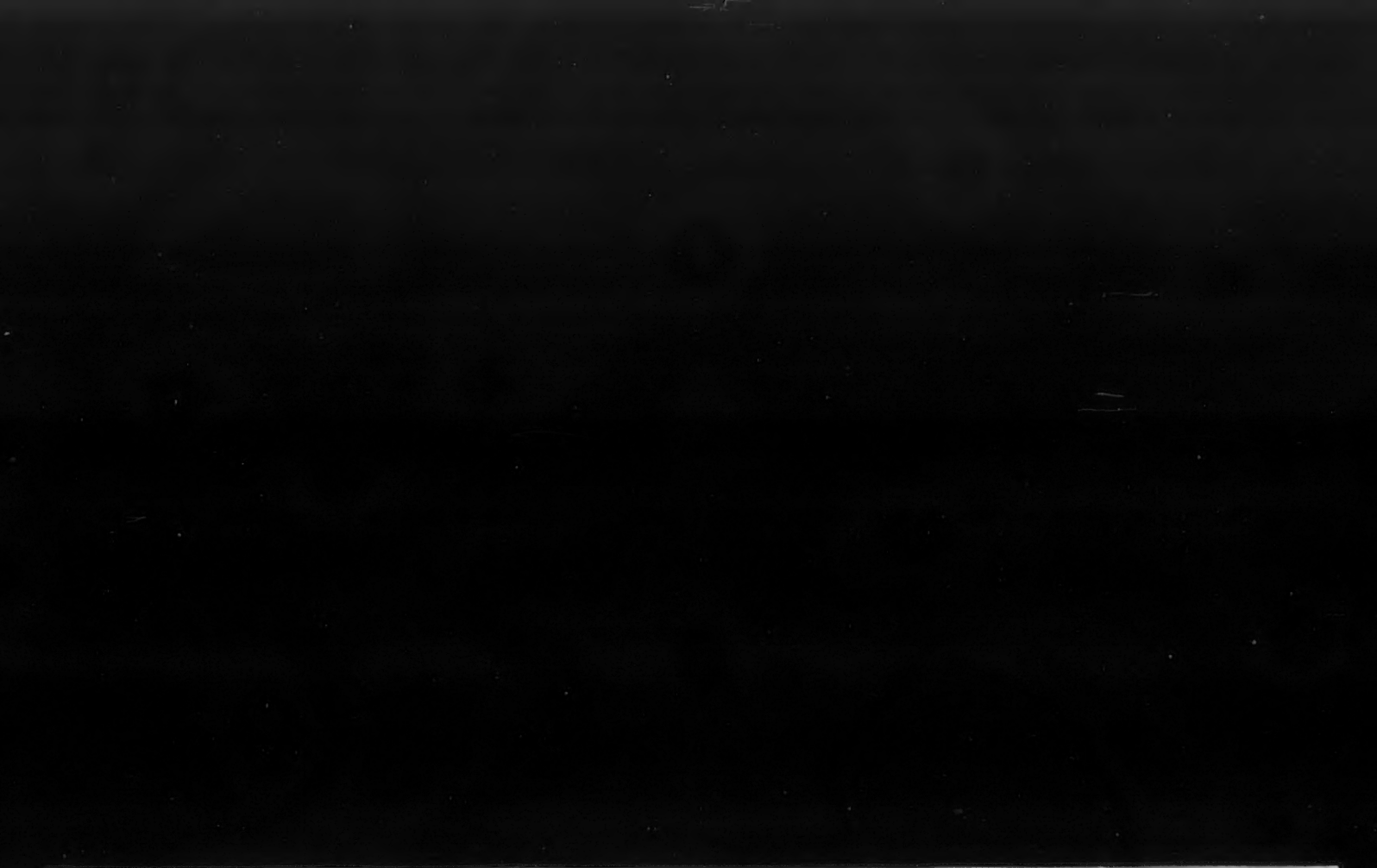
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